Abstract for TFISE Poster

Poster Title: Developing a method for detecting and characterizing Ag nanoparticles in soil pore water using asymmetrical flow field flow fractionation and ICP-MS

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Abstract:
As products containing manufactured nanoparticles (MNPs) continue to increase in use, the release of silver nanomaterials into wastewater streams is inevitable. Several studies have demonstrated extensive partitioning of MNPs to sewage sludge in wastewater treatment plants. In many parts of the world, the majority of sewage sludge is used as a soil amendment. Therefore agricultural soils are expected to be a major sink for MNPs in the environment. A grand challenge for establishing realistic ecological and human health risks associated with the release of MNPs to the environment is the absence of techniques for the in situ detection and characterization of manufactured MNPs in complex environmental matrices, such as soil. To address this challenge, we have developed a method for detecting Ag NPs in soil pore water. We evaluated various techniques for pore water extraction and pretreatment and optimized parameters for particle size separation and analysis. These techniques were used to investigate changes in stability and size distribution for Ag NPs having different surface coatings when incubated with soil, as well as following the addition of sewage sludge to soil. Asymmetrical flow field flow fractionation was used to separate different size particles extracted from soil pore water and coupled to UV-vis diode array, multi-angle/dynamic light scattering and inductively coupled plasma mass spectrometry detection to characterize Ag containing colloids based on size. Our results suggest that surface coating plays a major role in the stability of Ag MNPs in soil pore water and that sewage sludge profoundly impacts Ag NP stability.